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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Application Number: 09/386,605
Filing Date: August 31, 1999
Appellant(s): TAYLOR ET AL.

Robert Hanson
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 03/17/2008 appealing from the Office action mailed 10/18/2007.

**(1) Real Party of Interest**

The Statement of Real Party of Interest is correct.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

Trulson et al., "Genetic transformation and controlled regeneration of cucumis SP in vitro." European Patent Publication No. 0262972, published June 4, 1988.

Simpson et al., "A disarmed binary vector from Agrobacterium tumefaciens functions in Agrobacterium rhizogenes," Plant Molecular Biology 6:403-415, 1986.

Savka et al., "Induction of hairy roots on cultivated soybean genotypes and their use to propagate the soybean cyst nematode," Phytopathology 80:503-508, 1990.

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 8-11 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Trulson et al (EP 0262972 A2 published April 6, 1988), in view of Simpson et al (1986 Plant Mol. Biol. Vol. 6 pages 403-415) and further in view of Savka et al (1990 Phytopathology 80:503-508).

Trulson teaches a method of producing a stably transformed chimeric cucumber having transgenic root tissue. Trulson et al teach obtaining a hypocotyl explant (page 5, lines 30-40), inoculating with Agrobacterium rhizogenes (page 5, lines 52-55), culturing (page 5, lines 52-55), and producing plants (page 6, lines 1-15). Trulson teaches obtaining an explant (page 5, lines 30-40) where the explant is a hypocotyl with the cut end below the cotyledon. Trulson teaches the cut end of the hypocotyl being contacted with Agrobacterium rhizogenes (page 5, lines 52-55). Trulson teaches placing the inoculated hypocotyl on a medium containing MS (page 6, lines 4-6). The limitation

of ¼ MS is a common optimization well known in the art that would have been appreciated by one of ordinary skill in the art. The limitation of ¼ MS salts does not appear to bring about any unexpected results nor contribute in any way to the result of having transgenic roots and wild-type leaves and shoots above and beyond providing a standard transformation medium. Trulson teaches placing the inoculated hypocotyl on a medium containing MS and a selectable agent (page 6, lines 7 and 8). Trulson teaches using kanamycin wherein the concentration of kanamycin in the media is 25 mg/L (page 7, lines 22-28), which is less than 50 mg/l.

Applicant defines a "chimeric plant" (specification., p. 4) as a plant having only a portion of its cells transgenic. Trulson's original plant material ( p. 5, lines 52-60) was a wild-type green cucumber seedling which had been inverted, cut at the hypocotyl, the cut end inoculated with Agrobacterium rhizogenes, and the inoculated end allowed to root. *Agrobacterium rhizogenes* is known in the art to specifically infect the roots, it has been identified as the causal agent of hairy root disease. This feature of the bacterium has been identified as a more efficient way to transform root material of plants and the proliferation of neoplastic roots from such a transformation has made this delivery system that system of choice among scientists wanting to target roots in plant transformation (see the first paragraph on page 503 of Savka et al, for example). This unique property already identified in the prior art would have provided one of ordinary skill in the art a means to transform primarily the roots to target root-specific pests of soybean such as the soybean cyst nematode. In fact, this unique property was used by researchers to primarily transform roots to cultivate soybean cyst nematodes for study

(see discussion of Savka et al). It would have been apparent to one of ordinary skill in the art to target such pests by using *Agrobacterium rhizogenes* as vectors for genes providing resistance to such pests that have root specificity. Furthermore, due to the resistance of countries to import genetically modified food, it also would have been obvious to one of ordinary skill in the art to select for plants that have only transgenic roots and not transgenic shoots or leaves so that they soybeans could still be used for export. It is well known in the art that such transformation procedures as outlined in both the instant invention and in the prior art naturally generate chimeric plants, and while Trulson et al teach the selection for the plants with transformed shoots and leaves, one of ordinary skill in the art with the knowledge stated above would just as readily select the plants generated by Trulson et al as discussed below with wild type shoots and leaves but transformed roots.

Trulson et al (p. 6, lines 45-55) harvested 690 roots from Agrobacterium rhizogenes-inoculated hypocotyl sections. Of these roots, 64 regenerated plantlets, 22 of which were positive for NPTII, the transgenic selection marker. Of the regenerated plantlets (11) which had never been selected for NPTII expression using kanamycin selective

growth conditions, two plantlets were positive for NPTII, as determined by the in vitro assay. Since these two plants had never been selected on kanamycin, the mother roots from which they came were transgenic for NPTII. However the mother plant (hypocotyl + stem + other green parts) was otherwise wild-type, since only newly growing roots would have been transformed. The protein encoded by the NPTII gene

confers kanamycin resistance to plants expressing this gene. Cucumber is a dicotyledonous plant.

Trulson does not teach soybean, cotton or potato, or the use of Agrobacterium Rhizogenes strain K599.

Simpson et. al. (1986) Plant Mol. Biol. vol 6, pages 403-415, teach the Agrobacterium Rhizogenes transformation of tomato and soybean (p. 409, Table 2) to produce transformed roots.

Savka et. al. (1990) Phytopathology vol 80, pages 503-508, teach that Agrobacterium Rhizogenes K599 is "by far the most effective in inducing hairy roots in soybean" (p. 506 ¶ bridging to p. 507).

It would have been obvious to one skilled in the art to apply Trulson et. al, to other dicot plants, such as cotton, given the knowledge that dicot plants are known to be susceptible to Agrobacterium Rhizogenes, without any surprising or unexpected results. It further would have been obvious to one of ordinary skill in the art to transfer the transformed roots to a hydroponic environment as hydroponic growth of plants is known in the art and a viable, accepted method for growing agriculturally important plants. Accordingly, the claimed invention is prima facie obvious in view of the prior art.

Given the knowledge that tomato and soybean are readily transformed by Agrobacterium Rhizogenes to produce transgenic roots as taught by Simpson et. al., and that Agrobacterium Rhizogenes strain K599 is exceedingly effective at producing transgenic roots on soybean, one skilled in the art would have been motivated to substitute for the cucumber of Trulson, the soybean and tomato of Simpson et. al., or

cotton, to produce transgenic roots, and to utilize Agrobacterium Rhizogenes strain K599 of Savka et. al., for its known effectiveness on soybean, to produce transgenic soybean, cotton and tomato root cultures. Thus the claimed invention would have been prima facie obvious as a whole to one of ordinary skill in the art at the time it was made, especially in the absence of evidence to the contrary. Accordingly, the claimed invention is prima facie obvious in view of the prior art.

**(10) Response to Argument**

Appellant urges that the Combination of Trulson et al, Simpson et al and Savka et al do not teach or suggest all claim elements, in particular, Appellant urges that Trulson et al does not teach the formation of a chimeric dicotyledonous plant having transformed roots and wild type shoots, stems and leaves (pages 4-5 of the appeal brief).

This is not persuasive because Trulson et al, do disclose such plants and this disclosure is evidenced by the results of their experimental data. Appellant's attention is drawn to Table I on page 7 of the disclosure by Trulson et al. Although it is presented that the first line without kanamycin selection, indeed, does show the formation of chimeric plants as evidenced by the number of NPT-negative plantlets, the second line shows that even in the presences of the selection agent of kanamycin there are 33 NPT-negative plantlets indicating that the roots, being the tissue used for regeneration necessarily contain the construct in order to survive the media with kanamycin and that the leaves, being NPT-negative, do not contain the construct. This is evidence that

chimeric plants have been generated, and further, that these plants are chimeric plants that have transgenic roots and wild-type (NPT-negative) shoots, stems and leaves. In addition to this evidence, it is generally recognized in the art that plant transformation often results in chimeric plants, and the generation of such chimeric plants is a normal part of transformation methods and procedures.

Appellant urges that the 9 asserted chimeric plants were never under selection and as such there is no basis to suggest the plants were transgenic at all, particularly since non-transformed root explants exhibit a similar amount of regeneration as transformed root explants (pages 5-6 of appeal brief).

This is not persuasive because in the materials and methods it clearly states that the initial transformation is accompanied by a selective step in which the ampicillin analogue Cefatoxime was used to ensure that recovered cells contained the transformation vector. While the whole regenerated plants may not have been under selection pressure during the latter phases of the growth cycle, the plant tissue during the early stages of regeneration, after transformation, was under selection pressure, namely Cefatoxime, and would have contained the transformation vector because the transformed plant cells would not have survived otherwise. The assertion by Appellant that there is no reason to believe that the plants contained any transformed tissue at all is not consistent with the results and the materials and methods indicating that transformation was successful by the survival of the plant tissue in media containing Cefatoxime.

Appellant further urges that even in the case of the 33 NPT-negative plantlets discussed above that there is no basis to believe that the plantlets were transformed at all.

This is not persuasive because in this case the plantlets have undergone two successful rounds of selection in which both the starting tissue by virtue of its survival in the Cefatoxime media and then further, the plantlet survival in media containing the selection agent, kanamycin both indicate successful transformation. Appellant has not provided any evidence to the contrary but has merely asserted that these plants may not have been transformed. Furthermore, it is noted that the method steps and materials of the claims in question do not provide any other selection steps than what have been provided in the prior art, indicating that these selection steps are indeed sufficient for determining positive transformants.

Appellant also urges that Trulson et al express a belief the plants are not transformed (page 6 of the appeal brief).

This is not persuasive because Trulson et al were clearly attempting to obtain plants that were also transgenic in the leaf and stem tissue, i.e. non-chimeric plants. When Trulson et al make the comment "…nor did it prevent regeneration of some NPT-negative plants" it is clear that with the goal of obtaining plants that were NPT positive in the leaves that these plants were not the plants they were selecting for and would have been discarded as being negative for positive transformation in the leaves. However, that does not indicate in any way that the roots were not transformed and that the plants were not stable chimeric plants as the evidence indicates, but rather that they were not

the plants of choice for selection. It would have been obvious to one of ordinary skill in the art to choose those plants, however, when the materials and methods of the invention by Trulson et al are taken together with the disclosures by Simpson et al and Savka et al. It was well recognized in the art at the time of invention that particular pests such as the cyst nematodes in soybean, are specific to the roots, and that therefore, a transformed root would be advantageous in soybean. Furthermore, it was also known in the art that when growing agronomically important crops that in order to export to certain countries that the harvested material may not be transgenic. Anyone of ordinary skill in the art would have appreciated these known facts, and would have been motivated to utilize the teachings of Trulson et al on soybean as suggested by Simpson et al and Savka et al, particularly in view of the state of the art.

Appellant urges that Applicant's method differs in that a suitable explant capable of maintaining a non-transgenic stem, leaves and other parts of the plant is used for the transformation.

This is not persuasive because Trulson et al also use an explant capable of maintaining a non-transgenic stem, leaves and other parts of the plant, as evidenced by the results under selection of plantlets with kanamycin. The only difference is in the selecting of such chimeric plants rather than throwing them away and such a selection is suggested by Savka et al as discussed in the office action, wherein the targeting of root pests such as nematode are desired and are known to attack the roots of soybeans (see page 503, last paragraph).

Appellants urge that the Simpson et al and Savka et al do not teach or suggest the claimed elements lacking in Trulson et al (pages 7-8 of appeal brief).

This is not persuasive because Appellant relies primarily on the argument that Trulson et al do not teach generation of a transformed chimeric plant with transformed roots and non-transformed shoots and leaves. As discussed above, the evidence in Trulson et al rebut such an argument and indicate that these claim elements have been taught by Trulson et al. Simpson et al and Savka et al were cited to show a motivation to transform soybean roots using A. rhizogenes. A. rhizogenes is known in the art to be specific to root tissue and this specificity is fully discussed in both cited references. Furthermore, Savka et al in particular show that the transformation of the roots and not the shoots was the main object and therefore such a chimeric plant as taught by Trulson et al, would have been desired. Appellants are urging primarily that Simpson et al and Savka et al do not teach the generation of chimeric plants, but this claim element is already satisfied by Trulson et al. Appellant appears to be arguing the references individually rather than as a whole which is not permissible.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Brent T Page

/Russell Kallis/

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